. APPENDIX 3-1

. ALLOCATION OF CONTROLLED DOCUMENT "LAMPF SOLID MODELING"

"Lampf Solid Modeling" is a book of drawings of structures and surroundings of the LANSCE beam delivery system. The drawings include the switchyard, Line D, PSR, LANSCE target, Service area, ER-1, ER-2, and targets two and four. The book contains views of solid 3-D models, plan and elevation views of the various areas with and without overburden, and cross sections through the various areas that were used as aids in shielding calculations. The position of the central rays are indicated on most drawings, but individual beam line elements are not depicted. The intent was to have a good set of as-built drawings of the structures for the purposes of calculating dose rates and shielding requirements. Most areas were re-measured and surveyed before the files were created. The original files were created in 1993 by Jeff Bingham and Vern Wolgamott of MEE-4 under the direction of Walt Sommer and Carol Wilkinson (AOT-2). They are three dimensional solid models in Unigraphics. The drawings combine a surface survey (TIN) by Kaiser Engineering with our own beam tunnel surveys. Dale Schrage, AOT-1, now has copies of the 3-D files on his workstation and copies of the originals B size drawings used in the book. Carol Wilkinson has E size drawings of the originals produced by MEE-4 in a filing cabinet in MPF-1, Room A110.

Issue Number	Issue date	Issued to: Name Phone	Group		MS
1-14	5/16/94	John Ledford	MEE-4	H817	7-2985
2-14	5/16/94	Dale Schrage	AOT-1	H817	7-1953
3-14	5/16/94	Carol Wilkinson	AOT-2	H838	7-8056
4-14	5/16/94	Carol Wilkinson	(file copy: MPF-1, Rm A110)		
5-14	5/16/94	Bob Macek	AOT-DO	H848	7-8877
6-14	5/16/94	Dan Fitzgerald	AOT-2	H848	7-6976
7-14	5/16/94	Torben Brun	LANSCE	H805	7-8841
8-14	5/16/94	Olin vanDyck	AOT-DO	H844	7-7323
9-14	5/16/94	Facility Manager	AOT-DO		
10-14	5/16/94	Kevin Jones	AOT-6	H812	7-4974
11-14	5/16/94	(Brun)			
12-14	5/16/94	(Brun)			
13-14	5/16/94	(Brun)			
14-14	5/16/94	(Schrage)			

. APPENDIX 3-2

. EXAMPLE OF SWEEP AND ENTRY PROCEDURE

. (REF: AOT-6 OPERATIONS MANUAL, SEC. 6.05.19 R2.1)

6.5.19 Sweep and Entry Procedures for P3 West

6.5.19.A Sweep Procedure for P3 West

6.5.19.A.1 Purpose

1. This procedure is intended to ensure that the P3 West Cave is cleared of personnel prior to beam operations.

6.5.19.A.2 Responsibilities

1. The ESH-1 Accelerator Health Protection Team shall
   a. provide one PSS-qualified person to assist with this procedure if needed.
2. Trained individuals shall
   a. ensure that this procedure is performed properly.
   b. immediately report any system deficiencies or difficulties in performing this procedure to the Central Control Room.

6.5.19.A.3 General Considerations

1. If the HP key timer **has not** timed out, the sweep team should consist of two individuals, at least one of whom must be trained.
2. If the HP key timer **has** timed out, the sweep team must consist of one PSS-qualified person from ESH-1 and one other trained individual.
3. In all cases the sweep team will hold all the door Kirk keys during the sweep.

6.5.19.A.4 Prerequisites

1. To prevent unauthorized entry during the sweep, all entry gates and doors are to be closed and locked or latched prior to the sweep.

6.5.19.A.5 Precautions

1. Observe all radiological area postings.

6.5.19.A.6 Procedure

1. If the "**CAUTION - RADIOLOGICAL BUFFER AREA** - FOR SWEEP CONTACT HP 7-7069 - **Elevated External Radiation Hazards May Exist in this Area**" sign is lit, contact ESH-1 Personnel to reset the MP-228 key switch and to assist with the sweep.
2. Inspect the inside and outside shield block and fence perimeters for ladders or other ready means of access to the tops of shield blocks and remove if found.
3. Turn on the "SWEEP IN PROGRESS - DO NOT ENTER" sign.
4. Make the following local paging announcement twice, prior to starting the sweep: "Personnel safety sweep of the P3 West Cave is now in progress. All personnel leave the P3 West Cave." The sweep team must ensure the proper operation of the paging system inside the cave.

   Note: If local paging is not available, a verbal announcement should be made.
5. Sound the PSS horn. The sweep team will ensure the proper operation of the horn inside the cave.
6. Ensure that all six door Kirk keys are in the possession of the sweep team.
7. Enter the cave, close the main door, and ensure that it is latched.
8. Ensure that the quick-release clip is installed on the inside of the East emergency egress door.
9. Ensure that no one is left inside the area by performing a careful visual check above, below, and behind all equipment, in alcoves, corners, etc.
10. Ensure that access to the three (3) cave SCRAM switches is not obstructed.
11. Reset 4 Safety Sweep Reset push-buttons in the cave.
12. Promptly exit the P3 West cave through the main door, close the door, and ensure that it is latched.
13. Return the door Kirk keys and capture the Transfer Key in the Transfer Key solenoid box.
14. Sound the horn.
15. The "**DANGER - VERY HIGH RADIATION AREA - PSS SECURED**" sign should come on ~30 seconds after the horn is sounded.
16. The channel may now safely be configured for beam delivery.

6.5.19.A.7 Documentation

1. None.

6.5.19.A.8 References

1. None.

6.5.19.A.9 Attachments

1. None.

6.5.19.A.10 Revision History

1. 1.0 Apr. 1, 1992 D. E. Helfer Initial version after draft review.
2. 1.1 May 22, 1992 D. E. Helfer Revised after management review.
3. 2.0 Aug. 7, 1994 M. W. Hardy / K. W. Jones Incorporated the formation and reorganization of AOT and ESH Divisions. Included checking of access to the tops of shield blocks during a sweep. Changed language for consistency. Included checking of emergency egress latch. Modified responsibilities.
4. 2.1 July 14, 1995 K. W. Jones Added requirement to check SCRAM switch access during sweep.

Note: **Revisions to the above SWEEP procedure must also be entered in section 10 of the following ENTRY procedure.**

6.5.19.B Entry Procedure for P3 West

6.5.19.B.1 Purpose

1. This procedure is intended to facilitate routine access to the P3 West Secondary Beam Cave during operating periods.

6.5.19.B.2 Responsibilities

1. The ESH-1 Accelerator Health Protection Team shall
   a. survey the P3 West Cave to verify shielding and beam-plug integrity when Line A beam is first delivered after an Annual Maintenance period or any shielding re-configuration.
   b. survey the P3 West Cave for residual activation after first beam delivery to a new experiment.
   c. establish posting and entry requirements should residual activation be detected after first beam delivery to a new experiment.
   d. inform AOT-6 Operations personnel in CCR of any changes to the entry requirements.
   e. ensure that inspection activities are properly monitored for residual activation and contamination.
   f. authorize access to and above the cave shield wall.
2. Trained individuals shall
   a. ensure that this procedure is performed properly.
   b. obtain authorization from ESH-1 prior to access to and above the cave shield wall.
3. Should radiological conditions warrant and should work need to be performed, the ESH-1 Technician shall determine the requirements for a Radiological Work Permit and/or additional dosimetry in accordance with ALARA requirements. All High Radiation Area activities require continuous ESH-1 coverage.

6.5.19.B.3 General Considerations

1. Entrance doors should be left locked and should not be blocked open.

2. If an access door is left open more than 60 seconds, the "**CAUTION - RADIOLOGICAL BUFFER AREA** - TAKE A KEY AND CLOSE DOOR - **Elevated External Radiation Hazards May Exist in this Area**" sign goes off and the "**CAUTION - RADIOLOGICAL BUFFER AREA** - FOR SWEEP CONTACT HP 7-7069 - **Elevated External Radiation Hazards May Exist in this Area**" sign comes on at the affected access key-bank.
3. If a KEY RELEASE READY cannot be obtained because of a power outage, a spare key may be obtained through the Central Control Room. AOT-6 Group Management must release the key. There may be a delay of up to 1 hour before the key is available. The following conditions must be satisfied:
   a) the primary H+ beam is OFF and LABL01/02 are inserted; or
   b) the AOT-6 Operations Shift Supervisor has assured that the primary H+ beam cannot be turned on.

   The spare PSS key must be in the possession of AOT-6 Personnel at all times.

6.5.19.B.4 Prerequisites

1. If the entry to be made is the first for a new experiment, contact the ESH-1 Accelerator Health Protection team and request a technician to accompany the entry and perform a survey.
2. If area radiological postings so require, contact the ESH-1 Accelerator Health Protection team and request a technician to accompany the entry.

6.5.19.B.5 Precautions

1. None.

6.5.19.B.6 Procedure

1. Obtain a "KEY RELEASE READY" as indicated on the attached diagram.
2. Release the Transfer Key by pushing the small push-button at the bottom of the Transfer Key solenoid box and turn the Transfer Key counter-clockwise.
3. Remove the Transfer Key from the Transfer Key solenoid box and unlock the access keys by inserting the Transfer Key into the empty keyhole in the brass block key lock and rotating the keys.
4. If the "**CAUTION - RADIOLOGICAL BUFFER AREA** - TAKE A KEY AND CLOSE DOOR - **Elevated External Radiation Hazards May Exist in this Area**" sign is lit, each individual entering the P3 West Cave must take a door Kirk key or be accompanied by an individual in possession of a door Kirk key. The door should be closed promptly after entry or exit.
5. All door Kirk keys must be returned to the key bank when work in the P3 West Cave is completed or the individual intends to leave the building.
6. The individual returning the last door Kirk key must capture the Transfer Key in the Transfer Key solenoid box.

6.5.19.B.7 Documentation

1. Use of a spare PSS key must be documented in the CCRLOG and on the sign-out sheet in the CCR Kirk Key cabinet.

6.5.19.B.8 References

1. None.

6.5.19.B.9 Attachments

1. Key release ready schematic diagram

6.5.19.B.10 Revision History

1. 1.0 Apr. 1, 1992 D. E. Helfer Initial version after draft review.
2. 1.1 May 22, 1992 D. E. Helfer Revised after management review.
3. 2.0 Aug. 7, 1994 M. W. Hardy / K. W. Jones Incorporated the formation and reorganization of AOT and ESH Divisions. Included checking of access to the tops of shield blocks during a sweep. Changed language for consistency. Included checking of emergency egress latch. Modified responsibilities.
4. 2.1 July 14, 1995 K. W. Jones Added requirement to check SCRAM switch access during sweep.

. APPENDIX 3-3

. CHECKLIST FOR BEAM DELIVERY

. (REF: AOT-6 OPERATIONS MANUAL, SEC. 2.08.C.2 R4.1)

BEAM DELIVERY TO LINE D / PSR / TARGET 1

REQUIREMENT	GROUP	DATE	INITIAL
Inspections/Shielding/Access Control			
Line D shielding configured for beam delivery and documented	AOT-2 / AOT-6	/	/
1L Service Area / Target Cell shielding configured for beam delivery and documented	MLNSC / AOT-6	/	/
ER-2 Crane Access Hatches inspected, posted, swept, and locked with configuration control locks	AOT-6		
Service Area Limited Access Control Area established, badge reader operational, and access control list operational	AOT-6 / AOT-FM	/	/
ER-1 Limited Access Control Area established, badge reader operational, and access control list operational	AOT-6 / MLNSC	/	/
MEB Limited Access Control Area established, badge reader operational, and access control list operational	AOT-6 / AOT-FM	/	/
Verify MEB to 1L Service Area Hatch welded shut	AOT-6		
Verify MEB roof fence area inspected, posted, swept and locked with configuration control lock	AOT-6		
Interlocks			
Ch. 2.8.B.2 H- Line D/PSR/Target 1 RSS and RP Master Interlock Check requirements complete up to and including "LANSCE Production Mode"	AOT-6		
MLNSC Instruments ready for Target 1 operation (IPSS)	MLNSC		
Instrumentation			
Neutron detectors on continuous 1 minute recording (Attachment A)	AOT-6		
Other requirements as needed (Attach lists if necessary)			

H- Fast Protect Checks may begin to Line D / PSR / Target 1.

Reviewed and approved by _____ Date _____

(Proceed to Ch. 2.8.B.2, MLNSC H- Fast Protect Requirements)

BEAM DELIVERY TO LINE D / PSR / TARGET 1 (continued)

REQUIREMENT	GROUP	DATE	INITIAL
Interlocks			
Ch. 2.8.B.2 Line D / PSR / Target 1 Fast Protect requirements complete (Master Interlock Check)	AOT-6		
Posting			
Radiological Postings are correct throughout the area	ESH-1		
Administrative			
Radiation Safety Committee review complete	RSC		
Necessary Exemptions to Prompt Radiation Protection Policy approved and communicated to AOT-6 Operations	DDAOT		
Working copies of approved Sweep and Entry procedures posted for the Line D South Fence Area, 1L Service Area / Target Cell and Target 1 Roof Fence	AOT-6		
TA-53 Facility Management finds that H- tuning beam may be delivered to Line D / PSR / Target 1 (e.g., any necessary Safety Authorization Basis documentation in place)	AOT-FM		
Other requirements as needed (Attach lists if necessary)			

H- Beam (Tuning) may be delivered to Line D / PSR / Target 1.

Reviewed and approved by _____ Date

_____

REQUIREQUIREMENT	GROUP	DATE	INITIAL
Administrative			
Other requirements as specified by Radiation Safety Committee review (Attach lists if necessary)	AOT-6		
Other requirements as needed (Attach lists if necessary)			

H- Beam (Production) may be delivered to Line D / PSR / Target 1.

Reviewed and approved by _____ Date _____

—

. APPENDIX 3-4

Los Alamos
NATIONAL LABORATORY
memorandum

Program Director
LANSCE and Energy Research Programs - LANSCE/ER

To/MS Master Management and Administrative Support
From/MS: J. C. Browne, PDLER, H845
Phone/FAX: 7-5051/FAX 7-9409
E-Mail browne@lanl.gov
Symbol: LANSCE/ER:95-174
Date:: November 9, 1995

. ORGANIZATION OF OPERATIONS

SUBJECT: The TA-53 Accelerator Complex Has a New Mission…and a New Nam

The Laboratory has refocused the mission of its linear accelerator co has prompted several name and organizational changes. With the closeout user program and the increased national need for neutrons, the new miss development and use of spallation neutron sources for research and appl linear accelerator complex formerly known at the Laboratory as the Los Facility (LAMPF) will be called the Los Alamos Neutron Science Center (future. LANSCE, an acronym that formerly referred solely to the Manuel Scattering Center, now also comprises the high-power proton linear acce Storage Ring (PSR), the Weapons Neutron Research (WNR) facility, and a experiment areas, in addition to the Manuel Lujan Jr. Neutron Scatterin

Additional name changes at the TA-53 accelerator complex have been ma mission. The former LAMPF linac is now the LANSCE linac. The Manuel Luj Scattering Center now uses the initialism MLNSC and is referred to with Lujan Center. To honor Louis Rosen, who served as the director of LAMPF until 1986, the LAMPF auditorium in the TA-53 Laboratory Office Buildin Louis Rosen Auditorium at a ceremony on August 15. All name changes are 1.

Table 1 Summary of Name Changes

Former Name	New Name
Los Alamos Meson Physics Facility (LAMPF)	Los Alamos Neutron Science Center (LANSCE
Manuel Lujan Jr. Neutron Scattering Center (LANSCE)	Manuel Lujan Jr. Neutron Scattering Cente (MLNSC) or Lujan Center (internal use on
LAMPF linac	LANSCE linac
LAMPF Auditorium	Louis Rosen Auditorium

People from several groups and projects interact regularly to achieve
(Figure 1). To coordinate these efforts, John Browne, Roger Pynn, and S
together as the LANSCE management team while continuing their present pr
management duties. John Browne will serve as the director on the LANSCE
responsible for overall management and strategic planning. Roger Pynn wi
director of research programs and develop the research capabilities and
needs of the defense and scientific user programs. Stan Schriber will se
director of facility operations and ensure that the linac and experimen
scheduled, and managed in a manner consistent with the priorities of th
comply with all environment, safety, and health requirements.

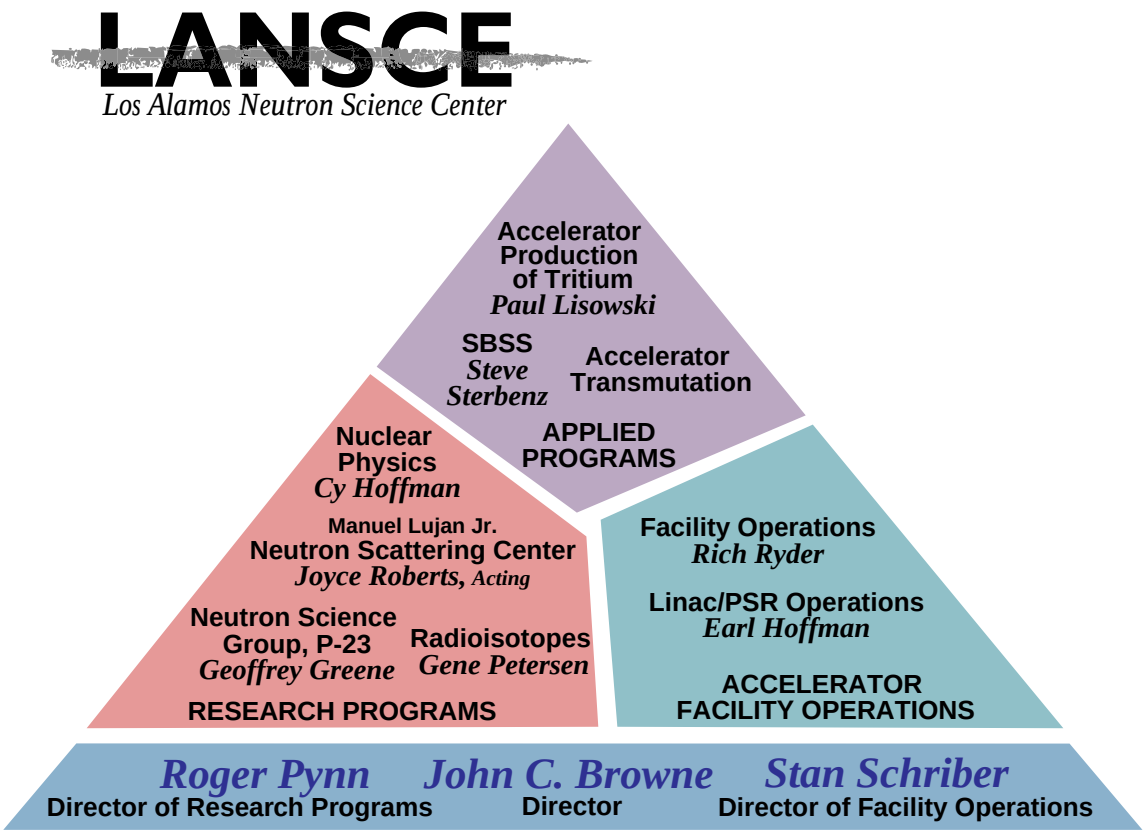

Figure 1 The triangle represents the synergistic relationships of groups and projects within the Los Alamos Neutron Science Center (LANSCE) that contribute to LANSCE's mission of becoming the United States center for the development and use of spallation neutron sources for research and applications.

These name and organizational changes support the FY95 tactical goal
Laboratory" at Los Alamos. Please distribute this information to employ
useful.

. APPENDIX 3-5

. HPI ALBATROSS NEUTRON SURVEY METER SAMPLE PAGE SUMMARIZING PRINCIPLES OF OPERATION, AND TITLE PAGE FROM JOURNAL ARTICLE DESCRIBING THE ALBATROSS METER

MODEL 2080 **PAGE 2**
INSTRUCTION MANUAL **HEALTH PHYSICS INSTRUCTION**

I. INTRODUCTION

The Model 2080 Pulse Neutron Survey Meter is designed to measure either pulsed or steady state neutron fields. The instrument may be operated either as a fixed monitor plugged into the wall, or portable with the internal batteries. The instrument displays the dose rate on a digital alphanumeric LCD display. The microprocessor based instrument incorporates many additional features to make it both easy to use and easy to maintain and calibrate.

II. PRINCIPAL OF OPERATION

The instrument uses the principal of nuclear capture to detect the neutrons. A 25 cm diameter polyethylene pseudosphere moderator thermalizes the neutrons. They are then captured by silver foil. The resulting beta activity is proportional to the previously acquired neutron dose. The betas are detected by a GM tube which is wrapped with the silver foil. Since the GM tube is also sensitive to external radiation not from the silver foil, a second GM tube is used to cancel out any background radiation. The second GM tube is covered with tin. This presents the same gamma attenuation as the silver.

The counts from each detector are scaled in two separate scalers. The response from the two detectors may not be the same to gamma rays due to differences in detector volume, gas pressure or shielding. The two tubes must be matched within 1% mathematically. The software multiplies the counts from each scaler to balance them, then subtracts the gamma counts from the neutron counts to obtain Net Neutron counts. It then divides this number by a calibration factor to obtain a corrected reading.

The resulting values because of the low counting rate need to be averaged over a period of time. This is performed by the digital filter. In essence it is a 16 register rotating stack which stores each new value over the oldest one, adds up the stack, then divides by 16 to obtain an averaged signal level. The time taken for a sample is determined by the Average Time.

The alphanumeric display can display several different parameters and functions besides the radiation level. In addition the microprocessor controls the outputs, lamps, and horn.

. APPENDIX 3-5 (CONT.)

. HEALTH PHYSICS VOL 38 (APRIL) PP 507-521

. PERGAMON PRESS LTD. 1980 PRINTED IN THE USA

A MICROCOMPUTER-BASED PORTABLE RADIATION SURVEY INSTRUMENT FOR MEASURING PULSED NEUTRON DOSE RATES*

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(Received 6 February 1979; accepted 31 July 1979)

Abstract—A special instrument is required to measure pulsed neutron dose rates in cases where the detector resolving time would result in significant count losses. Fermi National Accelerator Laboratory has developed a portable radiation survey instrument that uses silver foil activation to measure dose equivalent rates from pulsed neutrons. This article describes an instrument with a similar moderator and detector configuration but one in which digital processing in a one-chip microcomputer replaces the analog weighting and averaging circuitry. The result is a simpler, more versatile, and less expensive instrument that is easier to calibrate and that can measure neutron dose equivalent rates of 1-300 mrem/hr from neutron pulses of any duration.

1. INTRODUCTION

None of the commercially available survey instruments can correctly measure the pulsed neutron dose rate in cases where the detector resolving time would result in significant count losses. In the early 1970s Fermi National Accelerator Laboratory (Aw71) developed a portable instrument, the Albatross III, that uses silver activation to integrate neutron flux information. The activated silver beta decays at a rate slow enough to be counted by a Geiger Mueller (G-M) tube detector yet fast enough to follow changes in the neutron flux within several minutes.

Pulsed neutron dose equivalent rate instruments are needed at Los Alamos Scientific Laboratory (LASL), and although the detector configuration and operational features of Albatross III seemed appropriate, the complexity and lengthy calibration procedure of its analog circuitry were unattractive. Albatross IV is an updated version of Albatross III with completely redesigned

electronics and added operational features that make it more versatile and easier to calibrate. This paper is a review of the basic detector operation, functional description of the new electronics, calibration procedure, and results of the instrument evaluation.

2. NUCLEAR REACTION AND DETECTION

A 25-cm-diameter polyethylene pseudosphere (Fig. 1) is used as a moderator to thermalize neutrons. Once thermalized, the neutrons can undergo nuclear capture by the silver-foil nuclei according to the following reactions:

$$^{109}\mathrm{Ag} + n(\mathrm{thermal}) \rightarrow \gamma + {}^{110}\mathrm{Ag} \rightarrow {}^{110}\mathrm{Cd} + \beta^{-}$$

$$(\mathrm{half-life\ of}\ {}^{110}\mathrm{Ag}\ \mathrm{is}\ 24.4\ \mathrm{sec})$$

$$^{107}\mathrm{Ag} + n(\mathrm{thermal}) \rightarrow \gamma + {}^{108}\mathrm{Ag} \rightarrow {}^{108}\mathrm{Cd} + \beta^{-}$$

$$(\mathrm{half-life\ of}\ {}^{108}\mathrm{Ag}\ \mathrm{is}\ 2.4\ \mathrm{min}).$$

The isotopic abundance of ^{109}AG is approximately equal to that of ^{107}Ag; however,

*This work was done with support from the U.S. Dept. of Energy.

. APPENDIX 3-6

. OPERATIONAL OVERVIEW SAMPLE PAGES FROM THE EBERLINE RM-16 NEUTRON DETECTOR MANUAL

SECTION I

GENERAL

A. PURPOSE AND DESCRIPTION

The RM-16 is a compact, extremely versatile, four decade, logarithmic read-out count rate meter with single channel pulse height analyzer capabilities. It can be used with almost any proportional, scintillation or geiger detector. Power is supplied by a rechargeable gelled electrolite battery which is trickle charged when the instrument is plugged into the line. Four decades are displayed on a large meter with optically coupled set points which allow high and low alarm indications without interrupting the count rate indication.

The high and low set points are adjusted from the front panel and are displayed on the meter scale. The two alarms can be set anywhere on the meter scale. Connections for external alarm indications are provided on the rear panel.

A unique amplifier circuit with a charge sensitive input allows very high input sensitivity with excellent noise rejection. The readout is provided by a temperature compensated logarithmic voltmeter. External connections for ±5 mV and ±25 μA DC recorders are provided on the rear panel.

The detector voltage is adjustable over a wide range by a rear panel control. This allows setting to the proper operating voltage of a geiger tube or to the plateau of a scintillation or proportional detector. This adjustment, along with window width, also sets the energy being counted when in the PHA mode. The voltage range of the standard unit is compatible with most scintillation and geiger detectors, and, with a minor modification, for use with proportional detectors.

To use the PHA feature of the instrument the pulse height from the detector must be proportional to the energy of the radiation and vary with the high voltage applied.

Circuitry of the RM-16 is all transistor and integrated circuit, mounted on two plug in boards. The top cover is easily removed from access to internal components. A rear panel connection is also provided for an external scaler.

B. SPECIFICATIONS

1. INDICATOR

a. Scale: 4.50" (11.4 cm) with 4 logarithmic decades. 10^2 to 10^6 counts per minute standard, others available, such as 10^0 to 10^4 mREM/hr, 2 x 10^{-2} to 2 x 10^2 mR/hr, and 2 to 2 x 10^4 mR/hr.

b. Response Time: Varies continuously with count rate.

c. Linearity: Within ±10% of reading typically ±25% max.

d. Battery Dependence: Meter reading will change less than 5% when battery is within limits marked on meter face.

2. EXTERNAL CONNECTIONS

a. Scaler Output: 6 volt negative pulse.

b. Recorder Output:

(1). 50 μA: 25-0-25 μA DC.

(2). 10 mV: 5-0-5 mV DC.

c. Detector Input: MHV connector with variable high voltage to suit detector. Signal capacitively coupled to amplifier.

d. Alarm:

(1). LO Alarm: SPDT relay contacts, rated 6 amps, 120 VAC, resistive.

(2). HI Alarm: SPDT relay contacts, rated 6 amps, 120 VAC, resistive.

e. +6 volts: BNC connector to supply power to external detector, if required (Model RD-17).

3. ALARM

a. Alarm Point:

(1). HI: Locking type with alarm point adjustable over the entire meter scale.

(2). LO: Non-locking type with alarm point adjustable over the entire meter scale.

b. Visual Alarm:

(1). HI: Red lamp lights.

(2). LO: Blue lamp lights.

c. Audible Alarm:

(1). HI: Noise Penetrating squeal.

(2). LO: None.

d. Modifications: Either alarm may be changed to locking or non-locking type. See Section III, C, 1.

. APPENDIX 3-7

. CONTROL OF EQUIPMENT AND SYSTEM STATUS

. (REF: AOT-6 OPERATIONS MANUAL, SEC. 2.08 R3.2)

2.8 Control of Equipment and System Status

2.8.1 Purpose

1. The purpose of this section is to establish instructions for control of the equipment and systems used to operate the accelerator and beam delivery complex during turn-on, development, and scheduled operating periods.

2.8.2 Responsibilities

1. The AOT-6 Group Leader shall
   a. review and approve Master Administrative Check Schedules and authorize beam delivery.
   b. annually review additions to and deletions from Master Administrative Check Schedules.
2. The AOT-6 Equipment Readiness Coordinator(s) shall
   a. coordinate activities and system preparedness to establish operational readiness of equipment and systems necessary to the safe and reliable operation of the accelerator and beam delivery complex following an extended or inter-cycle maintenance period.
   b. establish reasonable limiting dates for operational readiness of equipment or systems necessary for operation.
   c. serve as the mediator between the appropriate Laboratory personnel and the AOT-6 operations organization in devising reasonable alternatives should equipment or system problems preclude meeting established readiness dates.
   d. coordinate the transfer of responsibility for control over appropriate equipment and systems from associated owning organization personnel to the AOT-6 operations organization and from the AOT-6 operations organization back to associated owning organization personnel.
   e. relay to the Operations Shift Supervisor through timely orders equipment readiness information that might affect an operating crew's ability to achieve required readiness conditions.
3. The AOT-6 Beam Delivery Team Leader shall
   a. ensure correct implementation of these instructions by the Beam Delivery Team.

b. ensure that a mechanism for maintenance requests/reports is established and available.

c. review maintenance requests/reports and ensure distribution to appropriate personnel.

4. The AOT-6 Staff Member On Call shall

a. remain abreast of equipment readiness concerns and progress.

b. assist the Operations Shift Supervisor as necessary when equipment readiness might preclude meeting established facility readiness or operations goals.

c. review and sign interlock checklists as needed.

d. initial and date the appropriate Master Interlock Check Schedules to signify that specific interlock checklists in subsequent chapters of this manual have been completed, reviewed and signed.

e. coordinate with the Equipment Readiness Coordinators and Operations Shift Supervisor in temporarily transferring control of applicable equipment and systems to and from respective owning organization personnel during maintenance and standby periods.

5. The Operations Shift Supervisor shall

a. with appropriate guidance from applicable Laboratory personnel and the AOT-6 Staff Member on Call determine whether equipment or systems meet operational readiness standards as required by published operating schedules.

b. ensure a pre-production checklist for the applicable beam (see sub-section 2.8.6.8 of this procedure) is completed prior to operations at beam current levels in excess of the thresholds specified in the pre-production checklists.

c. coordinate with the Equipment Readiness Coordinators and AOT-6 Staff Member on Call in temporarily transferring control of applicable equipment and systems to and from respective owning organization personnel during maintenance and standby periods.

6. Qualified and Trainee Operators shall

a. promptly inform the Operations Shift Supervisor of equipment readiness problems or concerns.

2.8.3 General Considerations

1. When any entry on a check schedule is initialed or signed, the corresponding date shall be the date when the initial or signature is affixed.

2. Instructions and checklists defining equipment or system operational readiness can be found in Chapter 9 of this manual.

3. Instructions and checklists defining Radiation Security System (RSS) readiness can be found in Chapter 6 of this manual.

4. Instructions and checklists defining Run Permit (RP) readiness can be found in Chapter 7 of this manual.

5. Instructions and checklists defining Fast Protect (FP) readiness can be found in Chapter 8 of this manual.

6. It is desirable that equipment readiness checks be satisfactorily completed or the necessary exceptions approved for a given area before Radiation Security System, Run Permit System or Fast Protect System interlock checks begin in that given area. The attached Master Equipment Readiness Check Schedule provides a ready reference.

7. The attached Master Interlock Check Schedules for a specific beam to be delivered to a given stop point in the accelerator or beam delivery area must be completed and approved prior to commencing fast protect checks or tuning/production beam operations to that point.

8. The attached Master Administrative Check Schedules for a specific beam operation to a given stop point in the accelerator or beam delivery area must be completed and approved prior to commencing beam operations (fast protect checks, tuning or production) to that point.

9. Changes to Master Interlock Check Schedules may be made by individuals authorized to approve these schedules (see 2.8.6.6).

10. Changes to Master Administrative Check Schedules may be made by individuals authorized to approve these schedules (see 2.8.6.7).

2.8.4 Prerequisites

1. None.

2.8.5 Precautions

1. It is essential that the operating crew and Operations Shift Supervisor be made promptly aware of changes in equipment or system status that might affect the readiness or operation of the accelerator and beam delivery complex.

2.8.6 Instructions

1. Following the guidelines in Chapter 9 of this manual, the AOT-6 Equipment Readiness Coordinator(s) should ensure that facility equipment and systems are ready for applicable Radiation Security, Run Permit or Fast Protect System interlock checks.

2. After the completion of the appropriate equipment readiness checklists, the AOT-6 Equipment Readiness Coordinator(s) should coordinate transfer of control of equipment and systems through the Operations Shift Supervisor to AOT-6 operations organization personnel.

3. The operating crew, at the direction of the Operations Shift Supervisor and with guidance from the AOT-6 Staff Member on Call, will then perform applicable Radiation Security and Run Permit System interlock checks on those systems under their control.

4. After Radiation Security and Run Permit System interlock checks have been satisfactorily completed they shall be reviewed and the review attested to by the AOT-6 Staff Member On Call.

5. After attesting to review of each checklist the AOT-6 Staff Member On Call will initial and date the necessary entry on the requisite Master Interlock Check Schedule.

6. When the required Radiation Security and Run Permit System Master Interlock Check Schedule has been completed for a given beam to a given stop location, the AOT-6 SMOC will review and approve this Master Interlock Check Schedule.

7. When the required Master Administrative Check Schedule in preparation for Fast Protect System checks has been completed for a given beam to a given stop location, the AOT-6 Group Leader will review and approve the Master Administrative Check Schedule and authorize performance of Fast Protect System checks.

8. The operating crew, at the direction of the Operations Shift Supervisor and with guidance from the AOT-6 Staff Member on Call, will then perform applicable Fast Protect System interlock checks on those systems for which the applicable Master Administrative Check Schedule has been approved.

9. After the Fast Protect System interlock checks have been satisfactorily completed they shall be reviewed and the review attested to by the AOT-6 Staff Member On Call.

10. After attesting to review of each checklist the AOT-6 Staff Member On Call will initial and date the necessary entry on the requisite Master Interlock Check Schedule.

11. When the required Fast Protect System Master Interlock Check Schedule has been completed for a given beam to a given stop location, the AOT-6 SMOC will review and approve this Master Interlock Check Schedule.

12. When the required Master Administrative Check Schedule in preparation for tuning beam has been completed for a given beam to a given stop location, the AOT-6 Group Leader will review and approve the Master Administrative Check Schedule and authorize appropriate tuning beam operation.

13. When the required Master Administrative Check Schedule in preparation for production beam has been completed for a given beam to a given stop location, the AOT-6 Group Leader will review and approve the Master Administrative Check Schedule and authorize appropriate production beam operation.

14. A beam pre-production checklist shall be completed prior to production beam delivery after scheduled or unscheduled maintenance or development periods in accordance with the requirements stated on the checklist form.

15. After the appropriate beam pre-production checklist has been satisfactorily completed, beam operation to meet scheduled goals may begin.

16. Operating configurations necessary to implement the published operating schedule should be established, at the direction of the Operations Shift Supervisor, using applicable Radiation Security, Run Permit and Fast Protect Systems, and associated operating procedures found in this manual.

17. Operating configurations should be maintained during scheduled operating periods using the framework of steps 14-16 above.

18. Routine changes to the established operating configurations (i.e. due to entries into experimental areas, etc.) may be made by qualified operators without immediate approval of the Operations Shift Supervisor. The Operations Shift Supervisor should be informed of such changes.

19. Non-routine unscheduled changes to established operating configurations due to Radiation Security, Run Permit or steady Fast Protect System trips shall be made only with the approval of the Operations Shift Supervisor.

20. If the scheduled operating configuration cannot be maintained due to equipment readiness problems, the Operations Shift Supervisor should determine, with guidance as needed from the AOT-6 Staff Member On Call, if appropriate personnel need to be contacted in accordance with guidelines described in Chapter 2, section 7 of this manual.

21. At the beginning of any maintenance period, the AOT-6 Equipment Readiness Coordinator(s) or the AOT-6 SMOC should oversee transfer of control of those systems to be worked on during the maintenance period from operations to the appropriate owning organization personnel.

22. Following any maintenance period applicable owning organization personnel, in collaboration with the AOT-6 Equipment Readiness Coordinator(s) or the AOT-6 SMOC, should determine, subject to the specifications of this manual, to what extent equipment or systems that have been worked on during maintenance periods need to be checked for operational readiness. Only systems or areas where configuration control for interlock systems has not been maintained need to have appropriate interlock checks performed. Interlock checks may be required subject to frequencies specified in other parts of this manual.

23. The AOT-6 Equipment Readiness Coordinator(s) or AOT-6 SMOC should oversee transfer of control of equipment and systems maintained during any maintenance period, following appropriate equipment readiness checks, through the Operations Shift Supervisor to AOT-6 operations organization personnel.

24. After any maintenance period, operation may resume after applicable portions of steps 7 through 13 (if required) of this section above and the appropriate Master Administrative Check Schedule have been completed.

25. During those occasions when development or production facility operations are suspended for scheduled or unscheduled maintenance, the Operations Shift Supervisor, with guidance from the Equipment Readiness Coordinators and AOT-6 Staff Member On Call may temporarily transfer control of equipment or systems to appropriate owning organization personnel.

26. The Operations Shift Supervisor, with guidance from the AOT-6 Staff Member On Call if needed, should determine to what extent equipment or systems that have been maintained during any suspension of operations need to be checked for operational readiness.

27. At the beginning of an extended maintenance period, AOT-6 operations organization personnel should relinquish control of facility equipment and systems to applicable owning organization personnel.

28. During an operating period, operating configuration changes should be documented in the CCRLOG.

29. Deficiencies in equipment readiness that do not immediately inhibit operation but merely inconvenience efficient operations and that cannot be corrected by operations crew personnel, should be documented in the CCRLOG and an electronic maintenance report should be completed.

30. All electronic maintenance reports should be reviewed by the AOT-6 Beam Delivery Team Leader.

31. Any equipment that has been repaired or replaced by the operating crew should be documented in the CCRLOG and in an electronic maintenance report.

32. Any temporary modifications to standard operating configurations due to equipment design inadequacies or readiness problems shall be authorized in accordance with Chapter 1, Section 3 of this manual.

33. Any temporary modifications to standard operating configurations should be documented in the CCRLOG.

2.8.7 Definitions

Most definitions applicable to this document are found in Chapter 1, Section 2 of this manual. Definition not found there are included here.

1. Routine: Not requiring special approval
2. Operating Readiness: An alignment of RSS, RP and FP Configuration: systems to ensure beam delivery within the operating and safety envelopes of the accelerator and beam delivery complex
3. Operational permits operational: A state of readiness within the normal operating guidelines of equipment or systems which control.
4. Given Area: A particular geographic area to which beam may separately be delivered.

2.8.8 References

1. DoE Order 5480.19, Conduct of Operations Requirements for DoE Facilities, 1990.

2.8.9 Attachments

1. Master Equipment Readiness Check Schedule
2. $H^+$and H^- Master Interlock Check Schedules
3. H^+ and H^- Master Administrative Check Schedules
4. H^+ and H^- pre-production checklists.
5. 201 RF operation Administrative Check Schedule

2.8.10 Revision History

1.0 May 12, 1992 K. W. Jones, MP-6 Original Version after draft review.

2.0 Apr. 19, 1993 D. J. Ostrem, MP-6 Changed sign off required to run beam to a given location, page 5 and 6. Added 01BL02 and 01BL03, A2 door shielding, SWYD fences, and TR shielding to Master Interlock Check Schedules

3.0 Apr. 14, 1994 - M. W. Hardy, AOT-6 - Incorporated the formation and reorganization of AOT, P, ESH and CST divisions. RSS/PSS is now referred to as RSS. Deleted reference to the ICRLOG. Deleted LXXM High/Low. Deleted D-BG hardware inhibit requirement. Incorporated changes for 2.8A, B, C & D as noted on the 1993 completed checklists. Incorporated changes to accommodate the installation of 14BL02/03 and 211 MeV mode modifications. Deactivated P- requirements. Added AOT-6 Group Leader responsibilities, eliminated exceptions authorization from 2.8.3.9, modified 2.8.3.9 for authorization to change Interlock check schedules, added 2.8.3.10 for authorization to change Administrative check schedules, modified 2.8.6.6 and 2.8.6.7 to improve language, and changed definition of Operating Period.

3.1 May 4, 1995 - M. Zumbro / D. Henderson / F. Gallegos / K. Jones, AOT-6 - Changed references to specific Laboratory organizations to more generic phrase, made minor editorial comments. Added log for initials of signing individuals on Appendix A. Added signatures for AOT-5 and AOT-FM. Changed other signatures to reflect organization changes. Made extensive revisions to Attachments 2.8.B.1,2 and 2.8.C.1,2 to incorporate lessons learned from 1994 operations and to improve operational implementation. Added new administrative checklist to be done after development periods for H- beam operations. Modified 2.8.3 and 2.8.6 to reflect re-organization of Master Interlock and Administrative Check Schedules separating out authorizations for Fast Protect, Tuning Beam and Production Beam operations.

3.2 April 26, 1996 - J. Merrill / K. W. Jones - Changed LAMPF to LANSCE, LANSCE to MLNSC, Operations Team to Beam Delivery Team, maintenance request cards to electronic maintenance reports. Revised all attachments to reflect; lessons learned from 1995 operations; changes to ER-1 access; NDs moved to Run Permit; new RSS plug checks 6.17 and 6.18; decommissioning of some RM-16s and some Area A caves; Limited Access Areas; PACS; MP-228 changed to AT-62; and current hand processed changes. Also changed text references from “AOT-Division” to “owning organization,” and “AOT-6 Operations” to “AOT-6 operations organization.” Changed definitions of Maintenance Day, Inter-cycle Maintenance Period, Annual Maintenance Period and Production to include scheduled/planned, configuration control status, and a less definite statement about production threshold current. Incorporated changes for new PACS areas. Added H- checklist for transition to development activity. Added checklist for running RF in Sector A (2.8.E). Added administrative requirements based on maintenance period actions. Deleted many definitions and referenced General Definitions in Chapter 1, Section 2. Changed “facility configuration” to “operating configuration” to avoid confusion. Added AOT Operations Manager review. Revised checklists 2.8.B.1/2, 2.8.C.1/2 to incorporate 1996 Linac Readiness Review, known configuration changes, and other requirements identified in 1995 as needed.